

Hangman Creek TMDL Updates

- Spokane River TMDL
- Dissolved oxygen/pH TMDL study
- Changes and updates to TMDL report
- Next steps

Spokane River TMDL

August:

- ▶ EPA determined their interpretations of Washington's standards were wrong.
- ▶ Interpretation error resulted in changes needed to Idaho permits (EPA issues NPDES permits for dischargers in Idaho).
- ▶ Ecology's TMDL modeling was based on Idaho permit limits.
- ▶ TMDL would need revisions to account for new Idaho permit limits.

Spokane TMDL –Continued–

Result:

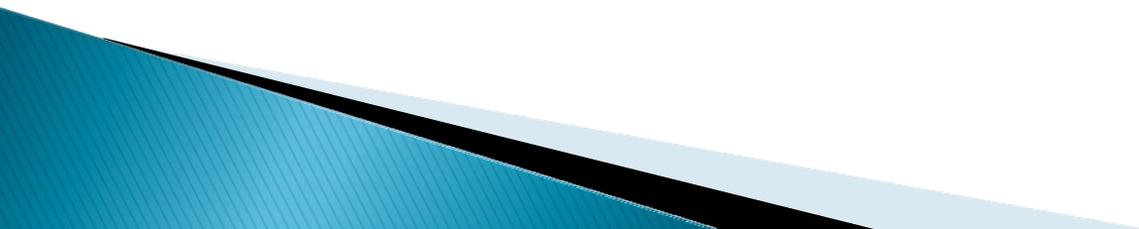
- ▶ New modeling scenarios being developed by EPA, IDEQ, Ecology & Spokane Tribe.
 - Cumulative contribution to low DO from all point sources (Idaho and Washington), rather than linked models.
 - Include Avista's contribution to low DO (Long Lake Dam)
 - Include new flows required for Spokane River by Avista's 401 certification
 - Include new estimate of Hangman Creek natural conditions
 - Etc.
- ▶ Hangman Creek's load allocation may change as result of new modeling
- ▶ Modeling results expected May 2009; draft TMDL September 2009.

Dissolved Oxygen/pH TMDL Study



Dissolved Oxygen/pH TMDL Study

Goals

- Complete a technical analysis for DO and pH TMDLs in the Hangman Creek watershed
 - Better define phosphorus loading from Hangman Creek to the Spokane River
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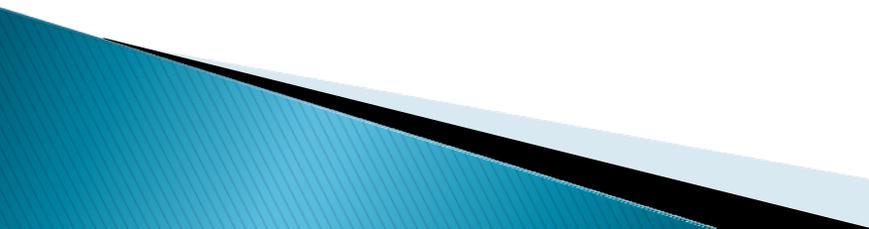
Dissolved Oxygen/pH TMDL Study

Waterbody	Parameter	Listing ID	Township	Range	Section
Hangman Creek at Stateline	Dissolved oxygen	41985	20N	46E	29
Hangman Creek at Bradshaw Road	Dissolved oxygen	41987	22N	44E	16
Hangman Creek at mouth	pH	11391	25N	42E	23
Rock Creek at Jackson Road	Dissolved oxygen	41990	23N	44E	23

Waterbody	Parameter	Proposed Listing Category	Listing ID	Township	Range	Section
Spangle Creek at mouth	pH	5	50382	22N	40E	16
Hangman Creek at Duncan Road	pH	5	50421	23N	43E	11
Hangman Creek at mouth	Dissolved Oxygen	5	11390	25N	42E	23
Cove Creek at Highway 27	Dissolved Oxygen	5	47036	21N	45E	30
Hangman Creek at Roberts Road	Dissolved Oxygen	5	47123	21N	44E	01
Hangman Creek at State Line	pH	2	50425	20N	46E	29
Hangman Creek below Tekoa	Dissolved Oxygen	2	8448	20N	45E	14
Hangman Creek below Tekoa	Dissolved Oxygen	2	8450	20N	45E	13
Rock Creek at mouth	pH	2	50377	23N	43E	12
Rock Creek at Rockford	pH	2	50378	23N	45E	33
Hangman Creek at Duncan Road	Dissolved Oxygen	2	47120	23N	43E	11
Hangman Creek at River Mile 21	pH	2	50422	23N	43E	13
Cove Creek at Highway 27	pH	2	50343	21N	45E	30
Little Hangman Creek near mouth	Dissolved Oxygen	2	8451	20N	45E	24
Little Hangman Creek at mouth	Dissolved Oxygen	2	41988	20N	45E	13
Marshall Creek at mouth	Dissolved Oxygen	2	41989	25N	43E	31
Marshall Creek at mouth	pH	2	50417	25N	43E	31
Marshall Creek at McKenzie Road	Dissolved Oxygen	2	47118	24N	42E	22

Dissolved Oxygen/pH TMDL Study

Tasks

- ▶ Collect nutrient & diel pH and DO data from listed areas
 - ▶ Estimate the time-of-travel through the watershed during critical periods
 - ▶ Conduct two intensive surveys during the critical period
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Dissolved Oxygen/pH TMDL Study

Tasks (continued)

- ▶ Collect additional nutrient & diel pH and DO data:
 - Reference sites in the four Level IV Ecoregions
 - Idaho border sites for Hangman, Little Hangman, and Rock Creeks
 - Wastewater treatment plants
 - Key watershed sites during run-off events

Dissolved Oxygen/pH TMDL Study

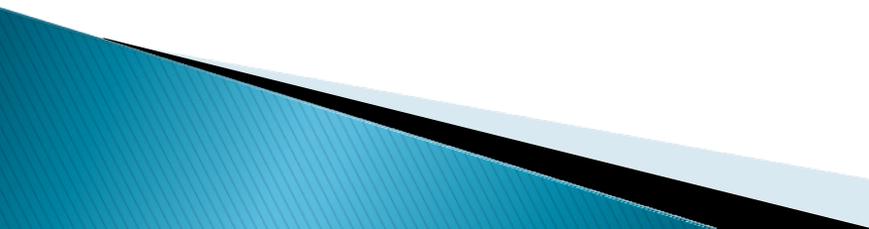
Schedule

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Border and Reference Network		1	1	1	1	1	2	2	2	2	1	1	1
Synoptic low-flow event											1		1
Run-off event				1*			2 – 3*						
Reconnaissance survey	1												

*Run-off or storm events sampled in the winter months, and during the spring snowmelt.

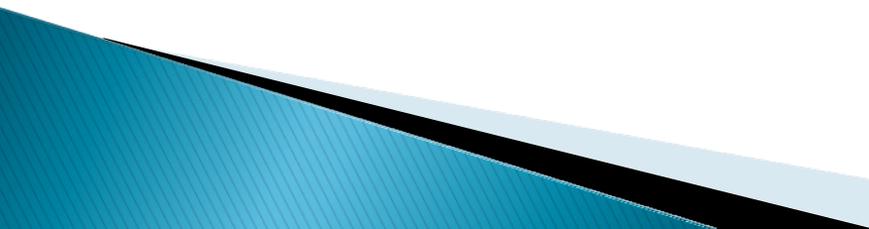
Dissolved Oxygen/pH TMDL Study

Sites

- ▶ 36 Low-flow synoptic survey sites
 - ▶ 5 Border sites (3 branches of Rock Creek, Little Hangman & Hangman Creeks)
 - ▶ 3 reference sites (Palouse Hills site still has not been located)
 - ▶ 6 WWTPs (Tekoa, Fairfield, Spangle, Rockford, Cheney, Freeman School District)
 - ▶ 20 Storm event sites (border, reference, WWTP, major storm drains, & other key watershed sites)
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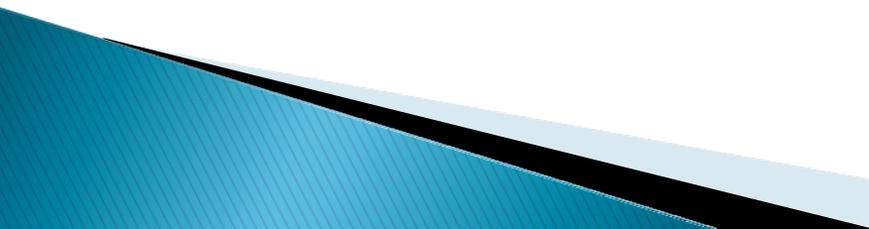
Dissolved Oxygen/pH TMDL Study

Parameters at Selected Sites

- ▶ 48-hr diel pH, DO, and temperature
 - ▶ Nitrogen, phosphorus, BOD5, TSS, total and dissolved organic carbon, alkalinity, chloride
 - ▶ Periphyton: chlorophyll *a* and ash-free dry wt
 - ▶ Discharge
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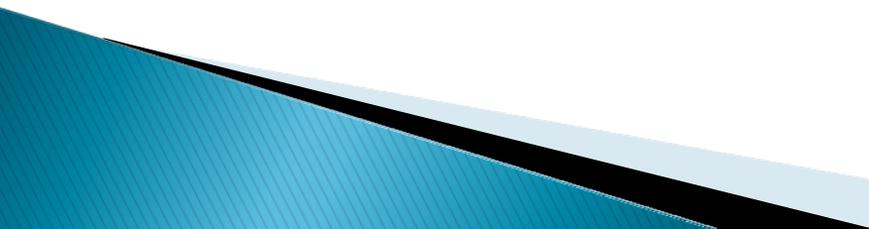
Dissolved Oxygen/pH TMDL Study

Modeling Approach

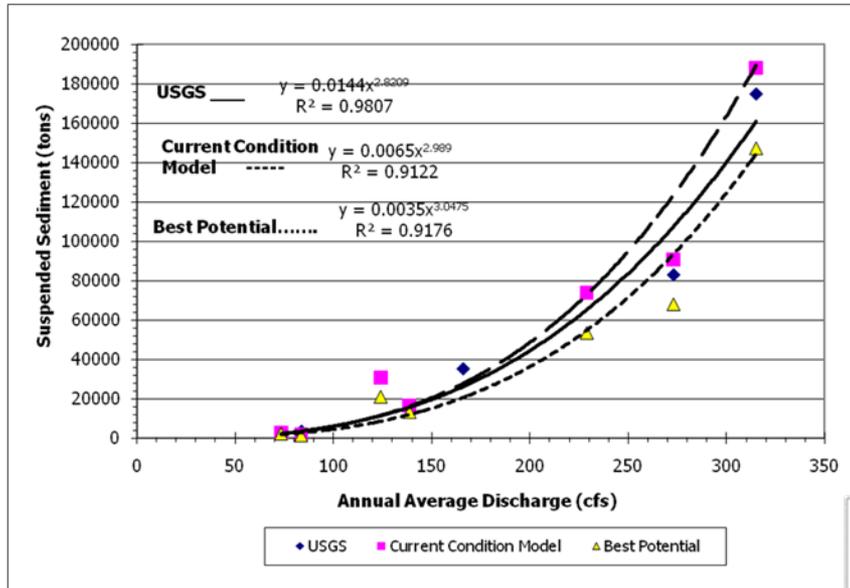
- ▶ QUAL2K to simulate pH and DO when the creek has complete channel connectivity
 - ▶ Maybe a series of pond models to simulate extreme low-flow conditions
 - ▶ WARMF to model storm event nutrient loading and transport
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Dissolved Oxygen/pH TMDL Study

Issues

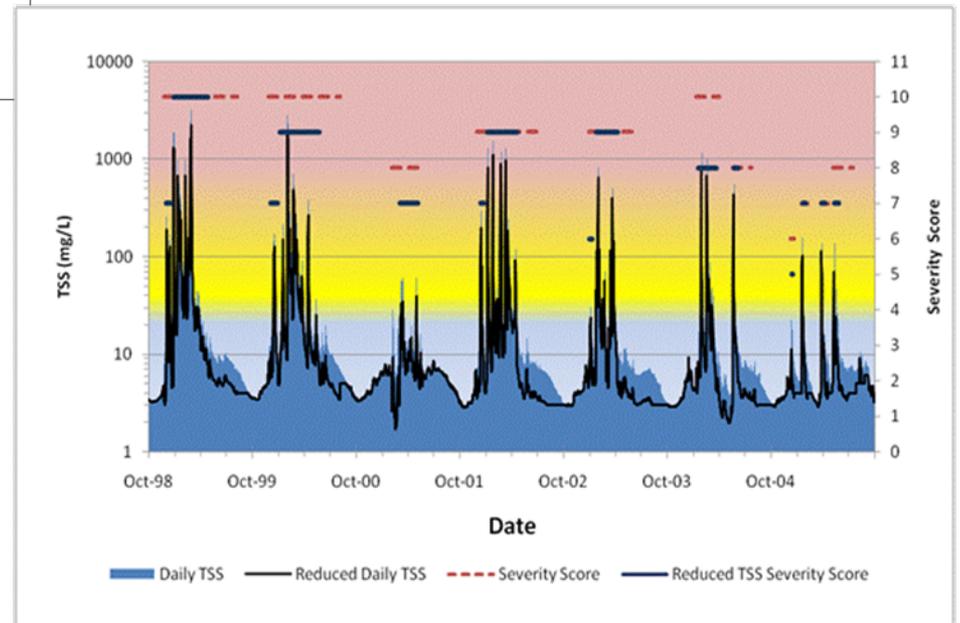
- ▶ Applying State water quality criteria when Hangman Creek is a series of pools
 - ▶ Groundwater sources of nitrogen
 - ▶ Options for point sources
 - ▶ Dovetail findings to Spokane River DO TMDL
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Changes to the current TMDL



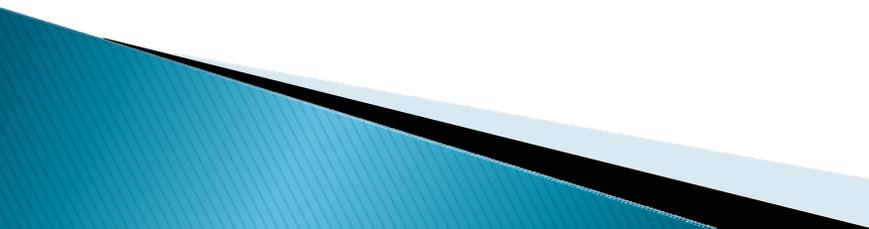
TSS TMDL Assessment Change of Emphasis

Response to Comments



Changes to the current TMDL

TSS/Turbidity Emphasis Change

- ▶ EPA requested we connect reductions to water quality standards
 - ▶ Aquatic life protection most appropriate beneficial use
 - ▶ Genetically distinct redband trout populations and other trout used as sensitive species
 - ▶ Severity scores calculated for TSS impacts on salmonids
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Changes to the TSS TMDL

Newcombe & Jensen, 1996. North American Journal of Fisheries Mgmt. *'Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact'*

Severity Scale	Description of Effect
No Effect	
0	No behavioral effects
Behavioral Effects	
1	Alarm reaction
2	Abandonment of cover
3	Avoidance response
Sub-lethal Effects	
4	Short-term reduction in feeding rates or feeding success
5	Minor physiological stress; increased coughing, increased respiration rate
6	Moderate physiological stress
7	Moderate habitat degradation; impaired homing
8	Indications of major physiological stress; long-term
Lethal and Para-lethal Effects	
9	Reduced growth rate; delayed hatching; reduced fish density
10	0 – 20% mortality; increased predation; moderate to severe habitat degradation
11	>20 – 40% mortality
12	>40 – 60% mortality
13	>60 – 80% mortality
14	>80 – 100% mortality

Changes to the TSS TMDL

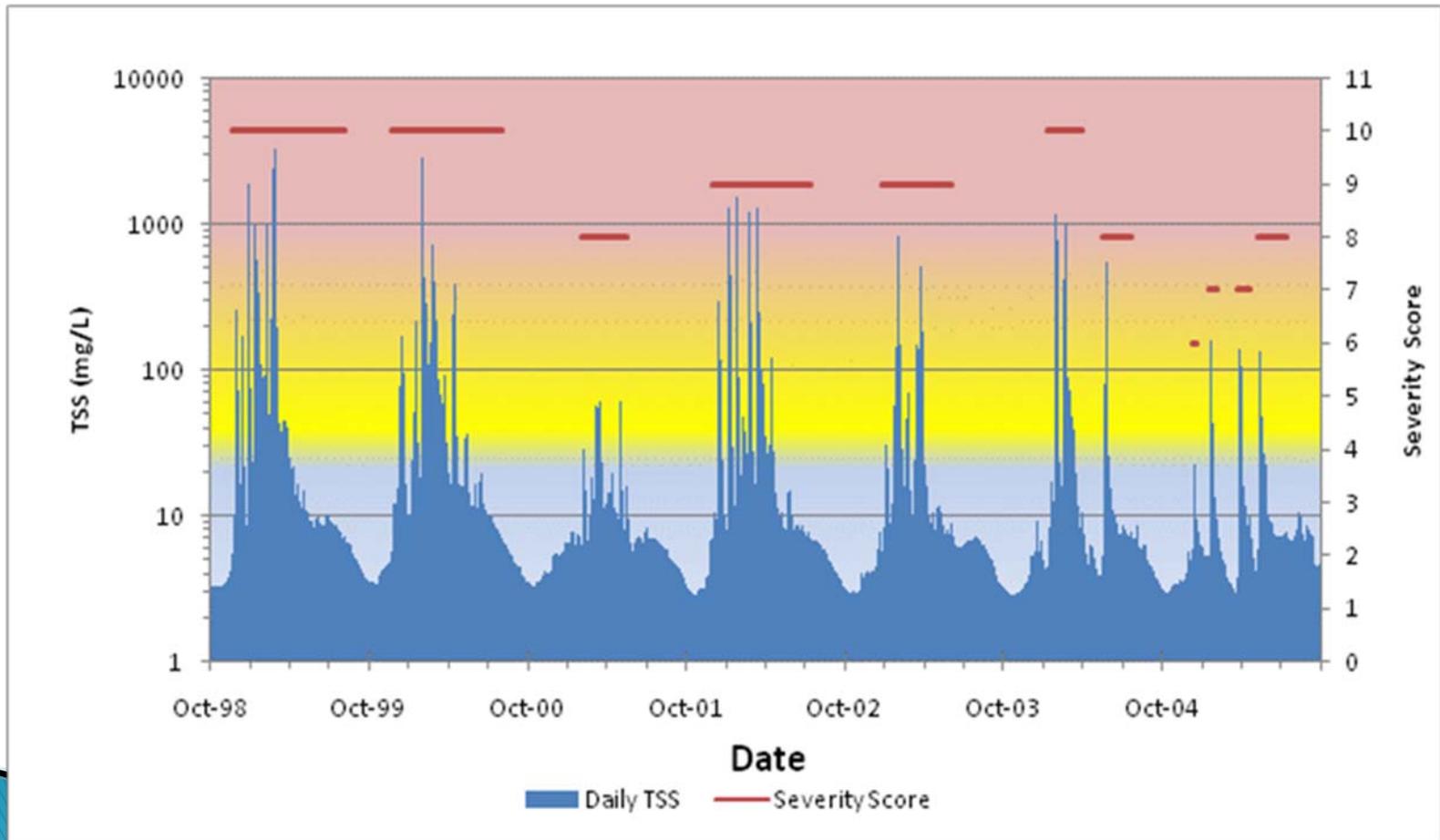
Severity score for adult & juvenile salmon & trout =
 $1.0642 + 0.6068(\log_e \text{Hours of exposure}) +$
 $0.7384(\log_e \text{TSS mg/L})$

Examples:

- ▶ TSS = 360 mg/L for 9 days (216 hours) = 9 (Lethal)
- ▶ TSS = 16 mg/L for 108 days (5760 hours) = 8 (High Sub-lethal)
- ▶ TSS = 16 mg/L for 2 days (48 hours) = 5 (Low Sub-lethal)

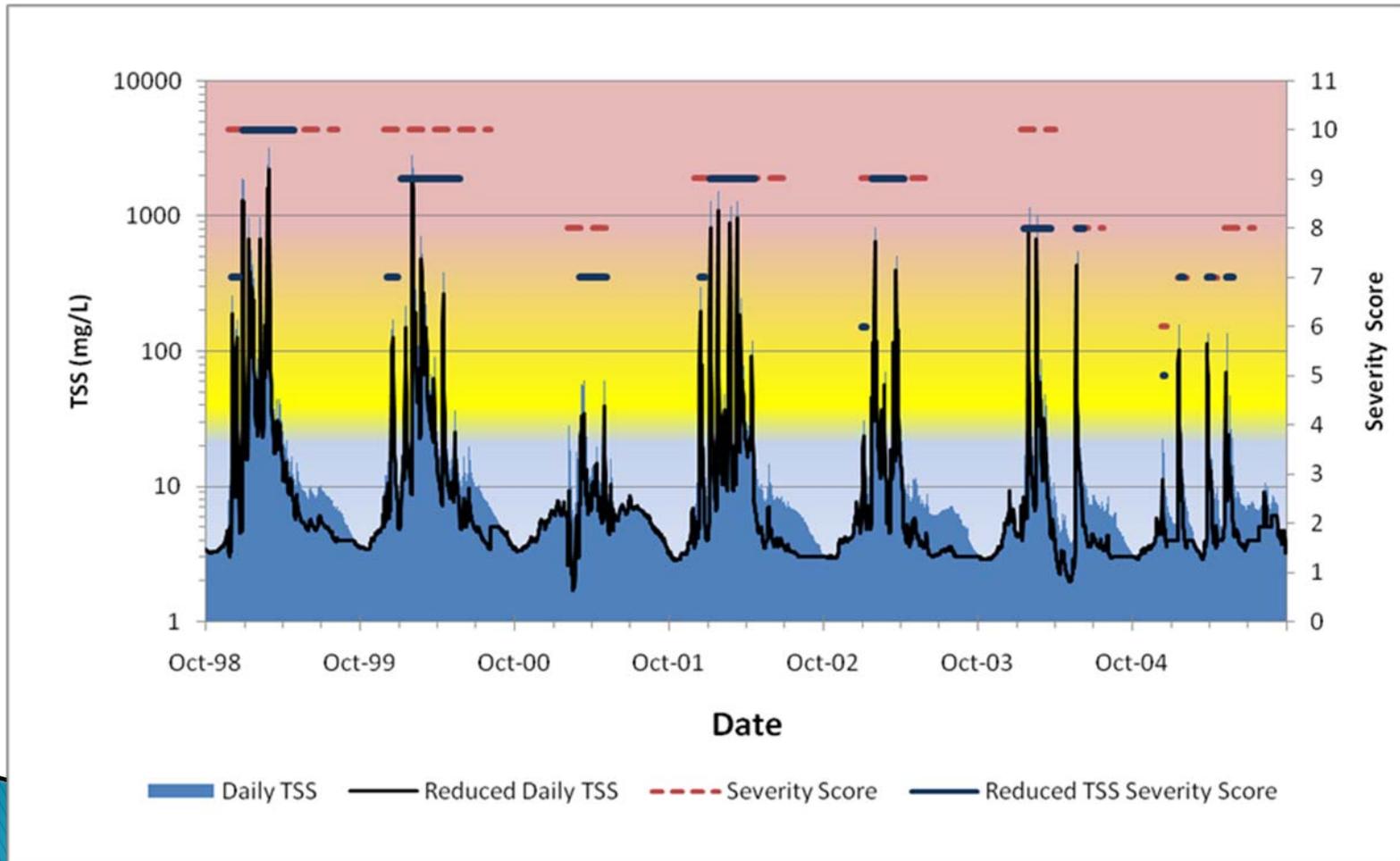
Changes to the TSS TMDL

Severity score formula applied to the estimated TSS concentrations at the mouth of Hangman Creek based on the multiple regression model output



Changes to the TSS TMDL

Score changes after applying TSS reductions estimated by the WARMF model at the mouth of Hangman Creek



Changes to the TSS TMDL

Results of Best Potential Scenario TSS reductions Severity Scores in the Hangman Creek watershed

- Shorter duration of TSS events
- More recovery time between events
- Less intensity of peak TSS concentrations
- Most improvement in mid-to-late-spring through the fall
 - time is most important for redband trout spawning (April - June) and emergence
 - important to eastern brook trout that spawn in fall
- Expect greater estimated reductions once the buffer zone option is functional in the WARMF model

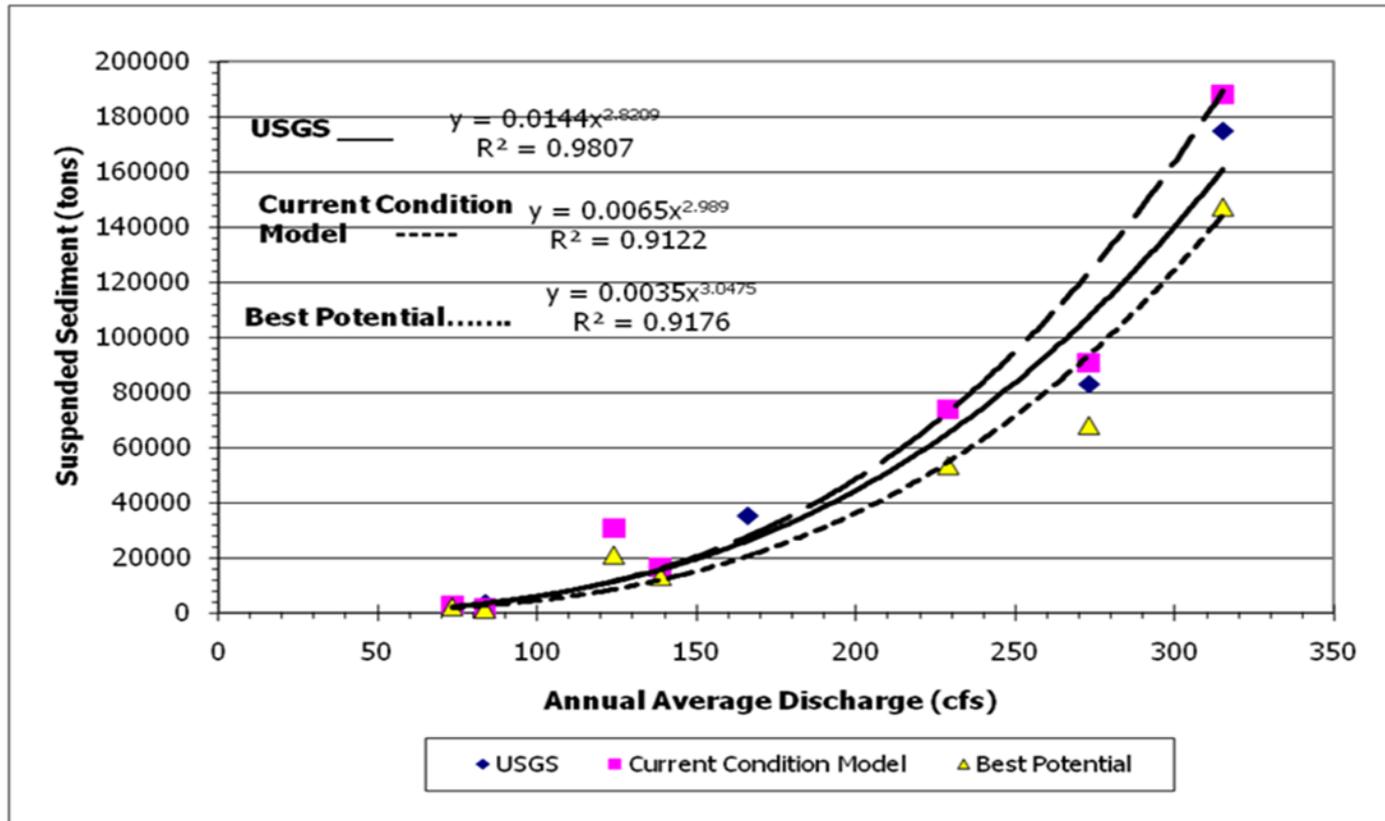
Changes to the TSS TMDL

Results of Best Potential Scenario TSS reductions on TSS Loads at the mouth of Hangman Creek

Water Year	Multiple Regression Model (tons/year)	Estimated Reduction	Estimated Load Capacity (tons/year)
1999	188,252	22%	147,206
2000	90,677	25%	67,872
2001	1,604	31%	1,109
2002	73,770	28%	53,326
2003	16,503	21%	13,101
2004	30,605	32%	20,846
2005	2,832	29%	2,022

Changes to the TSS TMDL

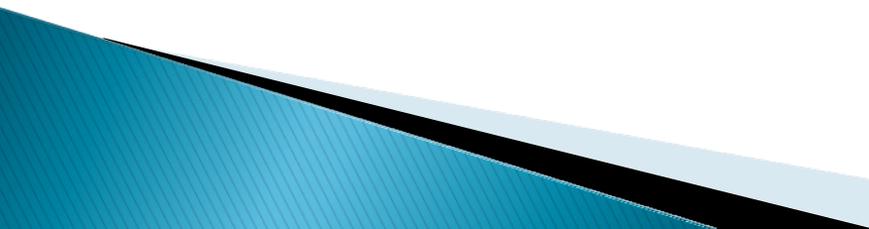
Results of Best Potential Scenario TSS reductions on TSS Loads at the mouth of Hangman Creek



Response to Comments

- ▶ Reference to phosphorus loading and meeting Spokane River DO TMDL have been removed
 - ▶ Table calculations have been reviewed and corrected
 - ▶ Language on FC records at WWTP/permit limits softened
 - ▶ Current FC permit limits for Fairfield were corrected
 - ▶ Point source elimination removed from TSS best potential scenario
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Response to Comments

- ▶ Stormwater requirements clarified to match MS4 permit language
 - ▶ Added language that future Implementation Plan will focus on steps to reduce nonpoint
 - ▶ Language added regarding landowner participation in implementation
 - ▶ “Effluent dominated” added to glossary; Tekoa’s dilution factors included in text
 - ▶ Other minor edits and changes
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Next Steps

- ▶ Send revised draft to advisory committee (December)
 - ▶ Seek committee recommendation to go to public comment by email
 - ▶ 30 day public comment period starting in January
 - ▶ Meet to review final report (March?)
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